

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

End – Semester Examination (Supplementary): November 2018

Branch: B. Tech (Common to all)

Semester: II

Subject with code: Engineering Mathematics – II (MATH 201)

Date: 27/11/2018

Max Marks: 60

Duration: 03 Hrs.

INSTRUCTION: Attempt any FIVE of the following questions. All questions carry equal marks.

Q.1 (a) Prove that $\cos^6\theta - \sin^6\theta = \frac{1}{16}(\cos 6\theta + 15\cos 2\theta)$. [6 Marks]

(b) If $an(A + iB) = x + iy$, prove that

(i) $\tan 2A = \frac{2x}{1-x^2-y^2}$ (ii) $\tanh 2B = \frac{2y}{1+x^2+y^2}$. [6 Marks]

Q.2 (a) Solve $(1 + e^x) dx + e^x(1 - \frac{x}{y}) dy = 0$. [6 Marks]

(b) Solve

$x - xdy + \log x dx = 0$. [6 Marks]

Q.3 Solve any TWO:

(a) Solve $y'' + 4y' + 13y = 18e^{-2x}$. [6 Marks]

(b) Solve $(D^2 + 5D + 4)y = x^2 + 7x + 9$. [6 Marks]

(c) Solve by the method of variation of parameters

$\frac{d^2y}{dx^2} + y = \operatorname{cosec} x$. [6 Marks]

Q.4 (a) Find the Fourier series of $f(x) = x^2$ in the interval $(0, 2\pi)$ and hence deduce that

$\frac{\pi^2}{12} = \frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \dots$ [6 Marks]

(b) Expand the function $f(x) = \pi x - x^2$ in a half – range sine series in the interval $(0, \pi)$.

[6 Marks]

P.T.O.

Q.5 (a) The necessary and sufficient condition for vector $\vec{F}(t)$ to have constant magnitude is

$$\vec{F}(t) \cdot \frac{d\vec{F}(t)}{dt} = 0. \quad [6 \text{ Marks}]$$

(b) A point moves in a plane so that its tangential and normal components of acceleration are equal and the angular velocity of the tangent is constant and equal to ω . Show that the path is equiangular spiral $\omega s = A e^{\omega t} + B$, where A & B are constants. [6 Marks]

Q.6 Solve any TWO:

(a) Find $\text{curl } \vec{F}$, where $\vec{F} = \nabla(x^3 + y^3 + z^3 - 3xyz)$. [6 Marks]

(b) If \vec{r} is a position vector with $r = |\vec{r}|$, show that

$$\nabla \cdot (r^n \vec{r}) = (n + 3)r^n. \quad [6 \text{ Marks}]$$

(c) Show that $\iiint_v \frac{dv}{r^2} = \iint_s \frac{\vec{r} \cdot \hat{n}}{r^2} ds$. [6 Marks]
